NEGOTIATION OF MEANING TO COMPREHEND HYPERTEXTS THROUGH PEER QUESTIONING

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Many college students who study English as a Foreign Language (EFL) are less-proficient readers as they have few opportunities to negotiate their perspectives for creating meaning through peer questioning in onsite instruction. This study reports on using online peer questioning to enhance less-proficient college students' negotiation of meaning in comprehending texts. A sample of 50 college students was divided into two groups based on the pre-test, into a more- proficient group and a less- proficient group, with 25 students in each group. The results of this study reveal that the less-proficient students made greater progress in reading comprehension than the more-proficient students after using the strategy of online peer questioning. The less-proficient students were able to explicitly observe how the more-proficient peers used integration questions, agreed or disagreed with peer responses, and finally constructed new understandings of the hypertexts. Particularly, the less-proficient students learned from the more-proficient peers on how to engage in critical thinking to express and share multiple perspectives. Using online peer questioning, both the more- and the less-proficient students frequently engaged in negotiation of meaning, interaction, and teaching one another. Their reading progress was reflected in the post-test, the types of questions and responses, and their perceptions toward using online peer questioning.

Language(s) Learned in this Study: English as a Foreign Language (EFL)

Keywords: Negotiation of Meaning; Computer-Supported Collaborative Learning; Peer Questioning; Reading Comprehension; Language Knowledge Construction

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INTRODUCTION

Many college students who study English as a Foreign Language (EFL) are less-proficient readers, and often are unable to cope with the high demands of college level reading courses and the academically-oriented English texts assigned by professors to obtain domain-specific knowledge (Beatie, Martin, & Oberst, 1984; Yang, 2010). The inability of college students to meet high academic demands is mainly due to little strategic intent in selecting effective and efficient reading strategies (Wood, Motz, & Willoughby, 1998) and the one-way teaching methods of language knowledge transmission (Dreyer & Nel, 2003). College students often do not engage in monitoring their reading process unless the teacher asks them to think about what they have learned through activities or instruction (Yang, 2010). To monitor reading processes, college students are encouraged to participate in continuous dialogues to negotiate different perspectives for creating meaning from new language experiences (Lee, 2001). Kumaravadivelu (1993) has indicated that negotiation of meaning means "[Learners] should be encouraged to ask for information, seek clarification, express an opinion, agree and/or disagree with peers and teachers" (pp. 12-13). The exchange of ideas and negotiation of meaning not only engages an individual in-group discussion to negotiate multiple perspectives, but also helps to create new language

learning experiences (Kessler & Bikowski, 2010). As a result, online peer questioning has become an emerging strategy to help students participate in negotiation of meaning for comprehending hypertexts without the restriction of time and space (Chiu & Hsiao, 2010).

Online Peer Questioning and Responses

Peer questioning has been commonly used to enhance negotiation of meaning and improve reading comprehension in small groups (Chiu, Wu, & Cheng, 2013; King, 1994; King & Rosenshine, 1993). Palincsar and Brown (1984) explicitly describe peer questioning as a strategy where students are encouraged to generate questions to help them comprehend the text, and answer their peers' questions for exchanging multiple perspectives and negotiating meanings on the same issues. Different responses to the same issues may lead to meaningful learning when students resolve conflicts through discussions (Cho, Lee, & Jonassen, 2011; Dekhinet, 2008). Citing Vygotsky's ideas on social constructivism (1978), Pea (1993) has proposed that knowledge construction is a social and dialogical process in which different perspectives are incorporated. Dialogues serve as an instrument of thinking in terms of clarifying and elaborating ideas and thoughts in negotiation process (Brown & Palincsar, 1989). Particularly in an online learning environment, students are able to ask further questions or to respond to peers' questions after reflective thinking on ideas and opinions (Cho, Lee, & Jonassen, 2011). That is, negotiation of meaning in online peer questioning could be optimized as students actively engage in sharing multiple perspectives and negotiate meanings in small group discussions (Golanics & Nussbaum, 2008).

To negotiate meanings in small group discussions, King (1994) divides questions into three types: factual, comprehension, and integration questions. Factual questions focus on the recall of information explicitly found in the text (e.g., Does Tina like to read English novels?). Comprehension questions help students make logical connections between facts (e.g., How did child abuse affect his mental process?). Integration questions help them connect prior knowledge with information learned from the text, thus integrating several concepts into new knowledge (e.g., What does the article imply in gender discrimination?). Three types of responses corresponding to the three types of questions are also identified (King, 1994). Knowledge restating refers to students' simple concepts or information read in the text. Students can easily find answers with a surface reading of the text. Knowledge assimilation refers to students' logical thinking where they make judgments about the information in the text. Knowledge integration is identified when students can integrate several concepts and make inferences beyond the stated information.

Statement of the Problem

While previous studies have examined peer questioning to improve college students' reading comprehension in a face-to-face environment, few studies have been done focusing on how college students negotiate their different perspectives in online peer questioning to improve hypertext comprehension. Peer questioning has mostly been examined in onsite learning environments; however, peer questioning in online learning environments may provide more interactive learning activities (Cho, Lee, & Jonassen, 2011). In traditional teacher-centered instruction, students have few opportunities share different ideas or negotiate their agreements or disagreements, as the teacher usually guides questioning in lectures (Samson, Strykowski, Weinstein, & Walberg, 1987).

Students' processing of question generation and the provision of responses are largely unobservable during onsite instruction. The lack of process data (log files) in onsite instruction makes it hard for teachers to observe and monitor their students' reading process and then participate in students' reading comprehension process. This may result in teachers having difficulties in providing appropriate scaffolding when their students encounter reading problems. Similarly, students are often unable to compare their reading processes with those of more-proficient students. They cannot obtain different perspectives and employ more-proficient students' reading strategies to discover their own deficiencies (Yang, 2012).

Study Background

This study reports on the use of online peer questioning to enhance less-proficient college students' negotiation of meaning in comprehending hypertexts. In traditional classroom settings, the teacher usually provides students with direct instruction and asks one or two questions to check on students' reading comprehension while reading academic English texts. This instruction leads students to become passive receivers as they merely receive the teacher's knowledge transmission. Students do not have many opportunities to monitor their own comprehension, share experiences with peers, negotiate their different perspectives, and consequently improve their reading comprehension.

Different from traditional settings, where students are asked only one or two questions by the teacher, this study encourages students to generate questions and to provide their peers with responses online. Each student was first guided by the teacher's explicit modeling on how to generate three types of questions (factual, comprehension and integration) and responses (knowledge restating, assimilation and integration). After receiving onsite instruction on questioning strategies, the students were expected to generate their own questions and provide their peers with multiple suggestions and comments online for enhancement of reading comprehension (Jalkanen & Vaarala, 2013).

With the focus of this study centering on whether online peer questioning can improve less-proficient college students' negotiation of meaning in reading comprehension, four research questions were posed:

1. What progress do college students make with their reading after using online peer questioning?
2. What types of questions and responses do college students ask and respond to between the more- and less-proficient groups?
3. How do less-proficient college students demonstrate their negotiation of meaning and reading comprehension through online peer questioning?
4. What are college students' perceptions toward using online peer questioning to enhance negotiation of meaning in reading comprehension?

METHODOLOGY

Participants

A sample of 50 college students from a university of science and technology in central Taiwan voluntarily registered for a reading program where they received a blended instruction of questioning. The 50 college students were from different departments and colleges. Before enrolling in the reading program, the students were made to take the reading section of a standardized English language test, The Test of English for International Communication (TOEIC), as the pre-test to determine the students' English reading proficiency level. The maximum score on the reading section of the TOEIC is 495, and the reliability of the TOEIC test is reported to be 0.90 (Chun Shin Limited, 2009). The task of online peer questioning is related to student reading proficiency (Cho, Lee, & Jonassen, 2011). If the less-proficient students are unable to identify key ideas in a reading passage, they may fail to generate high-quality questions (Tsai, 2004; Weinstock, Neuman, & Glassner, 2006).

As Cho, Lee, and Jonassen (2011) have noted, reading proficiency may affect students' comprehension and fail to generate higher level questions. Their study divided students into higher and lower groups based on different English language proficiencies, to investigate how students generate questions and provide responses to their peers, when carrying out meaning negotiation tasks. Similar to their research, this study grouped 50 college students into the more-and the less-proficient groups of 25 students in each group, in order to observe how they generated different types of questions and responses, and how they created new language experiences by learning from each other through online peer questioning. The more-proficient students' mean score and standard deviation on the pre-test were 289 and 12.43,

respectively while the less-proficient students' mean score and standard deviation on the pre-test were 164 and 34.72, respectively. The paired sample *t*- test also showed a significant difference between these two groups (t=5.67, $p < .05$).

System Development

The computer-supported collaborative learning (CSCL) system was developed in this study to help the students improve their negotiation of meaning through using online peer questioning. The system is divided into two modules, a student interface and a teacher interface. Four functionalities including a *dialogue box*, *discussion forum*, *chat room*, and *annotation tool* are incorporated into the system to encourage interaction between the teacher and students and among students themselves. Using these four functionalities, students are able to post questions and provide responses and further regulate their own reading.

The Student Interface

The student interface of the CSCL system encourages students to use the questioning strategy in order to become independent readers. For instance, students can generate one or more questions for their peers in the *discussion forum*. In the *discussion forum*, questions are posted and replied to by other students and the teacher (see Figure 1).

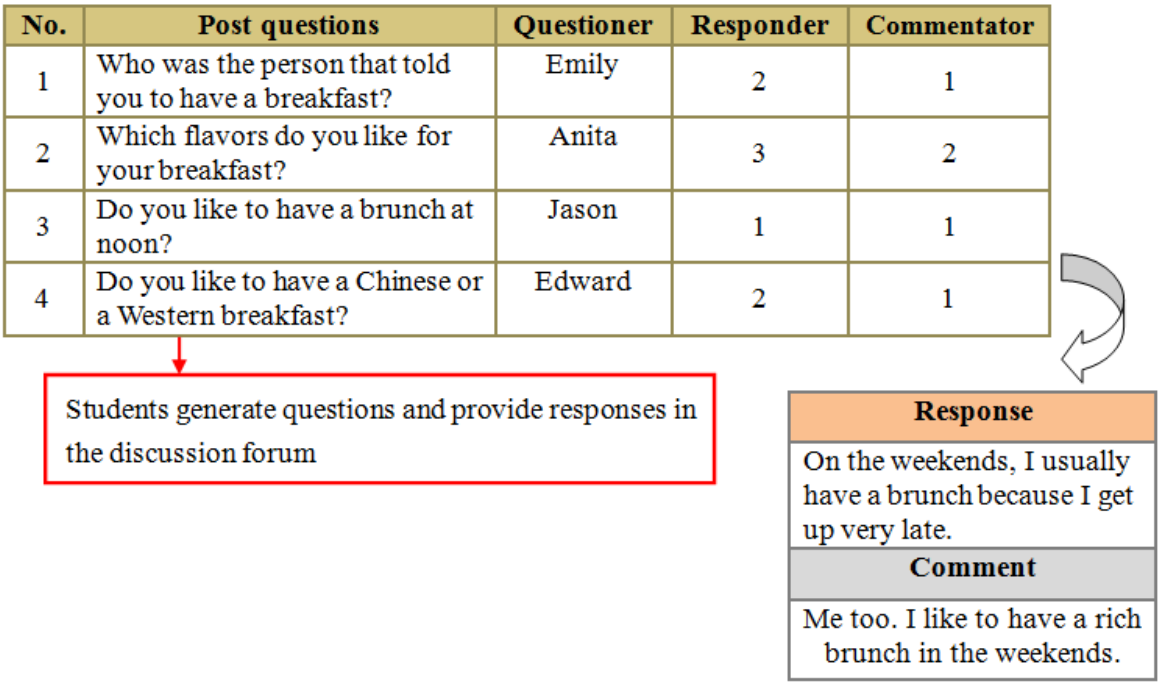
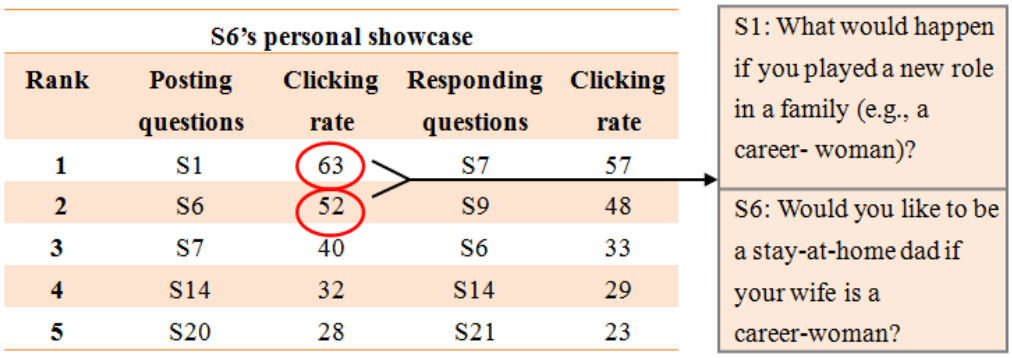


Figure 1. The interface of the discussion forum.

In addition, students' question generations and responses are ranked in the CSCL system by the clicking rate. The clicking rate refers to the frequency that students click to read a question. Based on the clicking rate, students are able to compare their questions and responses with other peers to diagnose their own reading difficulties and adjust reading strategies (see Figure 2).



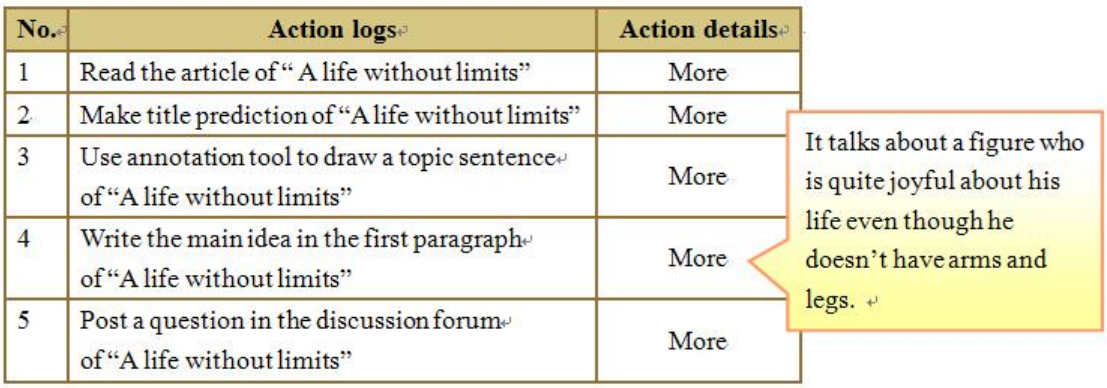
S6's personal showcase

Rank	Posting questions	Clicking rate	Responding questions	Clicking rate
1	S1	63	S7	57
2	S6	52	S9	48
3	S7	40	S6	33
4	S14	32	S14	29
5	S20	28	S21	23

Figure 2. Student clicking rates in posting and in responding to questions.

The Teacher Interface

The teacher can monitor students' interactions and reading process through the *log files* in the CSCL system (see Figure 3). The log files automatically record students' actions in the system such as reading, making annotations, asking questions, and answering questions in the *discussion forum*, and consulting the dictionary in order to look up unknown words. The system also provides the teacher with overall statistics regarding the actions that students take in the system. In other words, through reading students' log files, observing students' questions and replies in the *discussion forum*, and viewing the statistics of students' action details in the CSCL system, the teacher is able to diagnose students' reading difficulties in generating questions and comprehending the hypertexts.



No.	Action logs	Action details
1	Read the article of " A life without limits"	More
2	Make title prediction of "A life without limits"	More
3	Use annotation tool to draw a topic sentence of "A life without limits"	More
4	Write the main idea in the first paragraph of "A life without limits"	More
5	Post a question in the discussion forum of "A life without limits"	More

Figure 3. Student action logs in the system.

Procedure of Data Collection

This study, comparing online peer questioning between the more- and the less-proficient groups among college students, was conducted for twelve weeks. The students of the two groups were asked to read one academic text per week, with a total of 10 intermediate-level academic texts in 450 words, chosen from an English textbook (Anderson, 2007), for this study. Before the reading instruction began, the TOEIC pre-test was conducted to identify students' reading proficiency. The teacher provided the students with question prompts (e.g., question types) and examples (see Appendix) as the instruction began to help the students engage in collaborative and interactive discussions (Ainsworth, Gelmini-Hornsby, & O'Malley, 2011).

After receiving six weeks of onsite instruction (3hrs per week), the students were asked to take another TOEIC test (mid-test) to evaluate their reading progress; another version of the TOEIC test was used to

avoid repetition of the same test items. After this, the students were introduced to the CSCL system and were encouraged to generate questions and provide peers with responses in the *discussion forum* for the final six weeks. The teacher guided the students to play the three roles of questioner, responder, and commentator in the small groups for the online instruction. As questioners, the students had to generate questions to ask their peers after reading a text. The students then provided responses to their peers' questions in the role as responders. After receiving peers' responses, they played the role of commentators (Yang, Yeh, & Wong, 2010), which involved giving personal comments to their peers' responses. In playing these three roles, students were afforded ample opportunities to interact and to teach one another.

In the CSCL environment, the students received online instruction for enhancing their interactions and participation with peers by using the questioning strategy. At the end of the twelve weeks of the reading instruction, a total of ten students, five from each of the two groups, were selected by simple random sampling. Each student was given a random number with the same probability to be chosen by the researcher in this semi-structured interview for investigating student perceptions toward using the questioning strategy in the blended instruction. A TOEIC post-test, different from the previous two versions, was also given to examine the 50 college students' reading improvement after the 12-week instruction.

Procedure of Data Analysis

Data in terms of the TOEIC pre-, mid-, and post-test scores, students' action details in the log files, and their responses on the semi-structured interview were analyzed using both quantitative and qualitative methods. First, a paired sample *t*-test was compared to examine students' reading progress in onsite instruction (pre- and mid-tests), online instruction (mid- and post-tests), and the 12-week of blended instruction (the pre- and post-tests). Second, the different types of questions and responses of the more- and the less-proficient students recorded in the *discussion forum* of the CSCL system were counted by frequency and analyzed by means of the ANOVA. That is, in the coding scheme, three types of questions, namely factual, comprehension, and integration questions, were included while three types of responses, knowledge restating, assimilation, and integration, were also coded. The three types of questions and responses, and students' original reading proficiency (i.e., the scores of the TOEIC pre-test) made up the independent variables while students' scores on the TOEIC post-test made up the dependent variable in this study. Finally, the students' action logs recorded in the CSCL system, students' questions and responses, and a semi-structured interview, were analyzed by an in-depth qualitative content analysis.

Four steps of content analysis, including coding, categorization, description, and interpretation, followed. First, the researcher and the research assistant used highlights to code the meaningful statements from students' questions and responses, as well as from the semi-structured interview expressing their perspectives toward the onsite and online instructions (coding). Next, students' meaningful statements in terms of their questions were divided into three types, including factual, comprehension, and integration questions. Their responses were also divided into three types, namely, knowledge restating, assimilation and integration. In addition, their statements in the semi-structured interview expressing their perspectives were categorized (categorization). Then, the researcher and the research assistant described the statements by summarizing the main ideas (description). Finally, the main ideas were interpreted by providing explanations, making inferences, and drawing conclusions (interpretation). The inter-rater reliability, which was the degree of agreement among raters, was conducted by Kappa statistics to describe students' questions and responses recorded on the worksheets (onsite instruction), their questions and responses recorded in the log files (online instruction), and their perspectives expressed in the interview were 0.83, 0.84, and 0.86, respectively. The disagreement between the two raters (the researcher and the research assistant) was resolved by discussion. Data interpretation driven by these research methods is further explained in the following sections.

RESULTS

To investigate online peer questioning to improve the less-proficient college students' negotiation of meaning in reading comprehension, four categories of results are presented. First, students' reading progress is presented by the TOEIC pre-, mid-, and post-test scores. Second, the different types of questions and responses between the more- and the less-proficient groups were analyzed by the ANOVA to reveal how the students at different reading proficiency levels improved their reading comprehension after receiving online peer questioning. Third, a sample case L1 was randomly selected from the less-proficient group to illustrate how the less-proficient students negotiated meanings and improved comprehension through peer questioning in the CSCL system. Finally, the students' perceptions toward online peer questioning on improving negotiation of meaning and reading comprehension were revealed through the semi-structured interview.

The Students' Reading Progress between the Two Groups

In this study, the paired sample *t*-test was adopted to evaluate the students' reading progress of the two groups after receiving online peer questioning. The TOEIC pre-test aims to determine the students' reading proficiency level before the reading instruction began. The more-proficient students made no progress in reading as their mean scores decreased from 289 in the pre-test to 288 in the mid-test. No significant difference is shown between the pre- and mid-tests in reading (t = .06, p>.05). On the contrary, the less-proficient students made reading improvement when their mean scores increased from 164 in the pre-test to 178 in the mid-test, with medium effect size (*ES*=0.68). There is a statistically significant difference between the pre- and mid-tests in reading (t = -2.60, p< .05).

During the 12 weeks of the blended reading instruction, the more-proficient students made reading improvement when their mean scores increased from 289 in the pre-test to 304 in the post-test. A significant difference between the pre- and post-tests is shown in reading (t = -3.82, p< .05). A small effect size is found (*ES*=0.48). The less-proficient students made even more significant reading progress than the more-proficient students, as their mean scores increased from 164 in the pre-test to 198 in the post-test. A significant increase between the pre- and post-tests is shown in reading (t = -4.93, p< .00). There is also a large effect size (*ES*=0.82) in reading improvement. In other words, the strategy of online peer questioning was significantly more effective for the less-proficient students than for the more-proficient students after receiving blended reading instruction.

Different Types of Questions and Responses between the Two Groups

To investigate online peer questioning to improve college students' negotiation of meaning in reading comprehension, a series of ANOVA results were adopted. The independent variables were the three types of questions (i.e., factual, comprehension, and integration questions) and students' original reading proficiency (e.g., the TOEIC pre-test scores) for one set of ANOVAs and the three types of responses (i.e., knowledge restating, assimilation and integration) and students' reading proficiency for the second set of ANOVAs. A separate series of ANOVAs looked at individual proficiency groups by question and response type. For all of the analyses the dependent variable was the TOEIC post-test scores.

As shown in Table 1, no significant interaction is found between using factual questions and the students' reading proficiency (F =7.41; p= .25). However, there is a significant interaction between (a) reading proficiency and comprehension question (F = .27; p = .05), and (b) reading proficiency and integration question (F = 6.67; p = .01).. That is, an interaction effect was found between students' reading proficiency levels and questions types in comprehension and integration questions on their post-test reading comprehension, compared to factual questions.

Table 1. *ANOVA Results of Question Type and Post-test Reading Comprehension (N=50)*

Source	*SS*	*DF*	*MS*	*F*	*p*
Reading proficiency (A)	6304.49	1	354.60	40.80	.00**
Factual question (B)	1868.90	2	658.39	7.23	.16
(A)*(B)	1914.51	2	724.14	7.41	.25
Reading proficiency (A)	4007.90	1	4007.90	23.61	.00**
Comprehension question (B)	335.02	2	167.51	.98	.04*
(A)*(B)	46.35	2	46.35	.27	.05*
Reading proficiency (A)	1787.19	1	1787.19	20.51	.00**
Integration question (B)	586.56	2	293.28	3.37	.04*
(A)*(B)	581.55	2	581.56	6.67	.01**

*Note. *p < .05, **p < .01*

With respect to the students' responses, results are shown in Table 2. There is a significant interaction between both knowledge assimilation (F = 4.07; p = .05) and knowledge integration (F = 2.02; p = .02) and reading proficiency, but no significant interaction with knowledge restating is found (F = .81; p = .45). In other words, an interaction effect was found between students' reading proficiency levels and response types in knowledge assimilation and integration, compared to knowledge restating.

Table 2. *ANOVAResults of Response Type and Post-test Reading Comprehension (N=50)*

Source	*SS*	*DF*	*MS*	*F*	*p*
Reading proficiency (A)	2472.05	1	2472.05	14.82	.00**
Knowledge restating (B)	202.97	2	101.49	.64	.55
(A)*(B)	270.57	2	135.29	.81	.45
Reading proficiency (A)	2321.95	1	2324.95	20.38	.00**
Knowledge assimilation (B)	2085.12	2	1042.56	9.14	.03*
(A)*(B)	464.30	2	464.30	4.07	.05*
Reading proficiency (A)	2876.76	1	2876.76	24.79	.00**
Knowledge integration (B)	1956.76	2	978.38	8.43	.01**
(A)*(B)	469.42	2	234.71	2.02	.02*

*Note. *p < .05, **p < .01*

Table 3 depicts different question types on the reading progress between the more- and the less-proficient students after receiving the blended course of reciprocal peer questioning. For the more-proficient students, a significant effect is found on using integration questions (F = 3.05; p= .02), but no significant correlation is found on asking factual questions (F = 9.12; p = .29) and comprehension questions (F = 1.14; p = .12). That is to say, the more-proficient students understood how to integrate their prior knowledge with knowledge they gained from the text, so they generated integration questions rather than merely factual and comprehension questions.

In contrast, for the less-proficient students, the significance of using factual questions (F = 2.44; p = .05) and comprehension questions (F = 6.34; p = .01) is found, but no significance is found in using integration questions (F = .88; p = .36). This result indicates that some of the less-proficient students were able to recall the facts from the reading materials and make simple connections between their prior

knowledge and the text they had read, but they could not integrate several concepts to form new knowledge while they read the text. These less-proficient students still had to learn from the more-proficient students on how to generate integration questions.

Table 3. *ANOVA Results of Questioning between the Two Groups*

			SS	df	MS	F	*p*
The more-proficient students	Factual question	Between groups	2062.67	1	2062.67	9.12	.29
		Within groups	5201.36	23	226.14		
		Total	7264.03	24			
	Comprehension question	Between groups	343.51	1	343.51	1.14	.12
		Within groups	6920.49	23	300.89		
		Total	7264	24			
	Integration question	Between groups	850.69	1	850.69	3.05	.02**
		Within groups	6413.31	23	278.83		
		Total	7264	24			
The less-proficient students	Factual question	Between groups	253.23	1	1.42	2.44	.05*
		Within groups	183.17	23	32.51		
		Total	736.40	24			
	Comprehension question	Between groups	253.23	1	126.62	6.34	.01**
		Within groups	483.81	23	21.99		
		Total	737.04	24			
	Integration question	Between groups	27.307	1	27.31	.88	.36
		Within groups	709.73	23	30.86		
		Total	737.04	24			

Note: $p < .05$, ** $p < .03$*

The results providing different responses between the more-and the less-proficient students are shown in Table 4. For the more-proficient students, there is a significant effect on knowledge integration (F = 10.19; p = .01). However, no significant effect is found for knowledge restating (F =1.61; p = .22) and assimilation (F = 1.49; p = .24). In other words, the more-proficient students tended to provide peers with statements of knowledge integration going beyond the given information in the text. They were able to offer their peers more explanations, inferences and connections. They clarified their less-proficient peers' reading problems and decreased the proficiency gap between the more- and the less-proficient groups.

For the less-proficient students, knowledge restating (F= 3.28; p = .05) and assimilation (F= 6.34; p= .01) highlight significant effects on reading comprehension, but no significant effect on knowledge integration (F = 1.65; p = .21) is found. The results indicate that they were able to make simple and logical judgments to show their basic understanding when responding to peers' questions; however, they were unable to provide detailed explanations or combined prior knowledge with current learning experiences in the text.

Table 4. *ANOVA Results of Responses between the Two Groups*

			SS	df	MS	F	*p*
The more-proficient students	Knowledge restating	Between groups	920.56	1	460.26	1.61	.22
		Within groups	6589.58	23	286.50		
		Total	7510.14	24			
	Knowledge assimilation	Between groups	869.17	1	434.56	1.49	.24
		Within groups	6394.83	23	290.74		
		Total	7264	24			
	Knowledge integration	Between groups	2292.37	1	2229.37	10.19	.01**
		Within groups	5034.64	23	218.89		
		Total	7327.01	24			
The less-proficient students	Knowledge restating	Between groups	365.4	1	84.62	3.28	.05*
		Within groups	372	23	25.81		
		Total	737.4	24			
	Knowledge assimilation	Between groups	169.24	1	126.62	6.34	.01**
		Within groups	567.8	23	21.99		
		Total	737.04	24			
	Knowledge integration	Between groups	48.17	1	48.17	1.65	.21
		Within groups	669.83	23	29.12		
		Total	718	24			

Note: $p < .05$, ** $p < .03$*

The Less-proficient Students' Negotiation of Meaning through Online Peer Questioning

In this study, the less-proficient students, referred to as "L", and the more-proficient peers as "M", show their interactions and negation of meanings through online peer questioning. The sample case L1 was selected from the less-proficient group to show her reading process using paper-based and online peer questioning. In onsite instruction, L1 read an English text, generated one question and received two peers' responses. Negotiation of meaning in written form could become powerful as peers were able to give a fuller elaboration in order to successfully convey meaning (Koschmann, Kelson, Feltovich, & Barrows, 1996). Though L1 generated questions in written form after onsite instruction, the process of how she shared knowledge, negotiated with peers, and exchanged different perspectives through interactions, could not be documented. Without the process data (log files) to record the negotiation of meaning with peers, the students were unable to compare their reading processes with those of their more-proficient peers and reflect on their reading problems. Similarly, the teacher was unable to identify his students' reading difficulties to further assist them in enhancing reading comprehension.

To counter the drawbacks of onsite instruction, online peer questioning was employed to document L1's negotiation process with her peers in the log files (Figure 4). L1 was asked to read a text "Changing Roles: Stay-at-home dads" and to make hypertext annotations in order to grasp the main idea from each paragraph. Before generating her own questions, she first responded to M2's question "No, I do not think so. Stay-at-home dads are also very hard to support a family." Then M1 provided a further response that men lose face if they were unable to work in Eastern cultures. L1 proposed that she learned from M1 since she did not take social and cultural insights into consideration before. As L1 posted her questions, "What do you think about stay-at-home dads?" online, M3 responded that stay-at-home dads broke the stereotype that men should make a living for the family. However, M2 proposed that men still worked for the family if wives could not make enough money. According to the online negotiation in the *discussion forum*, the results indicate that the less-proficient students learned different perspectives on the same issues from the more-proficient peers' responses. They not only understood that social and cultural insights were very important when responding to peers' questions, but also were helped by the more-

proficient peers to engage in critical thinking for expressing multiple perspectives on comprehending social and cultural issues.

According to L1's actions in the log files of the CSCL system, her interactions with peers were investigated (Figure 5). L1 first responded to other peers' questions (students M1and M2) and then received three peers' responses (students L2, M2 and M3). The collaborative interactions of online peer questioning and responses were found to extend to other students. The CSCL system enabled L1 to observe the more-proficient peers asking questions, exchanging multiple perspectives, agreeing or disagreeing with peers' responses, and finally constructing new language understandings to comprehend the hypertexts. L1 mentioned that, "I liked to read the more-proficient peers' perspectives since I was able to engage in critical thinking after viewing their statements. I also clarify my reading problems as I posted the questions to clarify the difficult sentences."

Questioner	Question
M2	Do you think stay-at-home dads will lose face in their society?
Responder	Response
L1	No, I do not think so. Stay-at-home dads are also very hard to support a family. Response
Further response to L1	
M1	It is no doubt that men lose face if they stay at home all day in Eastern cultures. People may gossip and look down upon him.
Further response to M1	
L1	Social and cultural problems indeed affect how everyone looks at stay-at-home dads. I will think again as I respond to the questions. Thanks for your response.
Questioner	Question
L1	What do you think about stay-at-home dads?
Responder	Response
M3	It is a great performance to break a stereotype that men should make a lot of money for a family. Response
Further response to M3	
M2	If a female were a career-woman but she did not make enough money, the husband should make a living.
Further response to M2	
L1	Your response is good from different standpoints. I always focus on how great stay-at-home dads are. I will try to think differently in responding questions. Thank you.

The less-proficient student was able to click "Response" to provide further responses.

Figure 4. An example of online peer questioning.

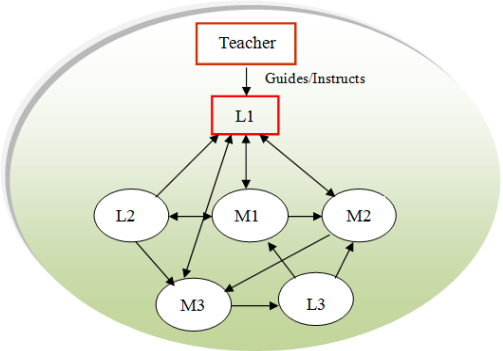


Figure 5. L1's interactions with peers in the CSCL system.

Students' Perceptions toward Blended Learning of Peer Questioning

In the semi-structured interview, five students were randomly selected from the more-proficient and the less-proficient groups, giving a total of 10 students. They were asked about their reading difficulties, negotiation of meaning, and the effectiveness of peer questioning in onsite and online instruction. According to Table 5, all of the interviewees from the more-proficient group had claimed they engaged in online peer questioning to interact and negotiate with their peers multiple perspectives in small group discussions. There were four interviewees (80%) who agreed that they were able to engage in critical thinking since they could ask integration questions (social and cultural issues) to show their better understandings of the texts. They also paid attention to their use of words and sentences to express correct viewpoints. On the contrary, all the interviewees from the less-proficient group confirmed that negotiation of meaning through online peer questioning could enhance their comprehension and enlarge their vocabulary size as they had to post questions and respond to their peers very often. There were four interviewees who proposed that they had improved their reading comprehension as they interacted and negotiated with the more-proficient peers to clarify their reading problems. However, some of them still had difficulties posting questions in terms of insufficient grammatical knowledge.

Table 5. *More- and Less-proficient Students' Negotiation of Meaning to Improve Reading Comprehension*

Students *(N=10)*		Frequency
More-proficient	1. I think I can interact with my peers by frequently posting questions and giving responses in negotiation of meaning.	5
	2. I deeply engage in thinking when generating questions because I want to post integration questions beyond the given information and show my better understanding.	4
	3. I engage in deep thinking on how to use correct English words and sentence structures to express my viewpoints while asking questions.	4
	4. I like to provide responses to less-proficient peers' perspectives for integrating social and cultural insights to enhance their reading comprehension.	3
Less-proficient	1. I had no experience generating questions and providing responses to my peers before using the CSCL system. I am very excited and interested in doing this to enhance my negotiation and reading comprehension.	5
	2. I can enlarge my vocabulary size as I have to look up words in the online dictionary while asking questions.	5
	3. I have a better understanding of the text because I can negotiate with more-proficient peers and observe their perspectives in the CSCL system.	4
	4. I have difficulty generating questions because of my limited grammatical knowledge in writing English sentences.	2

All of the interviewees in the two groups had positive attitudes toward the use of online peer questioning (Table 6). The students preferred to use online peer questioning and responses because they could interact with their peers in anonymity. Some students (50%) claimed that onsite peer questioning was time-consuming and laborious as they had to waste time waiting for their peers' responses. This might reduce students' motivation to interact or discuss with their peers. However, for online peer questioning, the students expressed that they had much more time to think about how to express their perspectives, to view different peers' responses, and to learn new language knowledge through intensive interactions with others.

Table 6. *Students' Perceptions toward Peer Questioning in the Blended Instruction (N=10)*

Description	Frequency
1. I like to provide online responses because of anonymity. Many of us are too shy to ask peers questions during onsite instruction.	10
2. In online instruction, I have more opportunities to view different types of questions and responses in the *discussion forum*. I can understand other peers' questions and responses by spending time reading them. It is a great opportunity for me to enhance my reading.	10
3. In online instruction, I can gain new language knowledge from peers' responses. Everyone has different ideas toward the same issue, and this is very interesting to me.	7
4. Sometimes I think onsite questioning and responses were time-consuming and laborious. I have to wait for my peers' responses for a long time.	5
5. I could think more deeply about my questions and responses online and practice my English writing at the same time.	4

DISCUSSION AND CONCLUSION

The results of this study have shown that online peer questioning should be recommended (Roscoe & Chi, 2007) to improve less-proficient college students' negotiation of meaning in enhancing reading comprehension (Choi, Land, & Turgeon, 2008; Yang, 2010). Particularly, in the CSCL system, the log files represented how the students asked questions, exchanged multiple perspectives, agreed or disagreed with others' responses, and constructed new language knowledge to comprehend the hypertexts without the limitations of time and location. This was very different from onsite teacher-centered instruction, in which the teacher usually guided the questioning and the students were only able to generate one or two questions due to very limited instructional hours.

First, the investigation of the more- and the less-proficient students on different types of questions and responses yielded various differences. The more-proficient students tended to ask integration questions to present their understanding beyond the given hypertexts and combined several concepts to form new language knowledge. They also utilized knowledge integration as they provided their peers with detailed explanations to help their peers acquire deeper understandings of the hypertexts. In contrast, the less-proficient students adopted factual and comprehension questions to show a fundamental understanding of the hypertexts. They made simple connections between their prior knowledge and the text. Regarding responses, they used knowledge restatements and knowledge assimilation to respond to their peers' questions based on their recollections of the text.

Second, the less-proficient students made greater reading progress after receiving online peer questioning than the more-proficient students. L1 was one of the sample cases used to show her reading process on frequent negotiation of meaning and interactions with more-proficient peers. According to L1's negotiation of meaning in small group discussions, it was found that the less-proficient peers mostly generated factual and comprehension questions, and provided knowledge restating and assimilation based on their prior knowledge and personal experiences to ask and respond to peers' questions. In terms of their inability to ask and respond to questions very often, the more-proficient peers' support was necessary to help them take social and cultural insights into consideration and to provide multiple perspectives with agreement or disagreement in negotiation of meanings. The less-proficient students were better able to engage in critical thinking and improve their reading comprehension as they observed how the more-proficient peers generated and responded to questions combined with multiple perspectives in social and cultural issues. By helping the less-proficient peers, the more-proficient students also

enhanced their comprehension with the clarification and elaboration of their own and the less-proficient peers' reading problems.

Finally, from the semi-structured interview, the more-proficient students benefited from online peer questioning since they were able to clarify and elaborate their own and the less-proficient peers' reading problems. The less-proficient students; however, still relied on the more-proficient peers' help to comprehend the difficult sentences or paragraphs for bettering reading comprehension. For the investigation of onsite and online peer questioning, most of interviewees proposed that they would like to use online peer questioning since they had more opportunities express multiple perspectives and share with their peers in anonymity. They also had much more time engage in critical thinking and think about how to generate and respond to other peers' questions.

This study has some limitations. First, since only 50 college students participated in this study, the sample size was not big enough to explain how all college students in Taiwan would benefit from using online peer questioning to enhance negotiation of meaning and reading comprehension. Second, the duration of strategy training may have been too short for the students to have sufficient time practice asking questions and providing responses. Finally, the teachers' perceptions as they take part in reading hypertexts with the students should be investigated so that teachers are better able to diagnose their students' reading difficulties and help them find solutions.

APPENDIX. The question prompts (King, 1994)

Question type	Questions provided
Factual	Does Tina like to read English novels?
Factual	When did Jack come back from Japan?
Factual	Where did Mary study abroad?
Comprehension	How did you decide to invest in property?
Comprehension	What is the main idea in this text?
Comprehension	How did child abuse affect his mental process?
Integration	What would happen if we had food crisis?
Integration	What does the article imply in gender discrimination?
Integration	Why has the Mediterranean diet attracted many nutritionists' attention?

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